

NOTES ON GALL-MAKING COCCIDS WITH DESCRIPTIONS OF  
NEW SPECIES. II.

By WALTER W. FROGGATT, F.L.S.

(Plates xvi-xvii.)

[Read 24th September, 1930.]

In this paper I add five new species to the genus *Apiomorpha*. Three of them in the coccid collection of the Queensland Museum I have been able to study by the courtesy of the Director (Mr. Heber A. Longman).

The female coccids are examined (when possible) and measured before they are boiled in potash. The descriptions are made upon the examination of the cleared mounted specimens. The specific characters are based upon the form and arrangement of the chitinous bands, spines and hairs, upon the dorsal surface of the derm, and the structure of the anal appendages which are very constant and distinct.

I have added notes on the exact locality and range of several species, and record the specific names of the Eucalypts upon which they develop, previously undetermined.

*APIOMORPHA DUMOSA*, n. sp.

I am indebted to Mr. W. S. Campbell (late of the Department of Agriculture) for the specimens of this coccid which he collected from a Mallee Gum (*Eucalyptus* sp.) near Mildura, Victoria.

The ♂ galls are typical circular tubes dilated at the apex, about 4 mm. in height, produced upon the small branchlets.

The ♀ galls develop upon the branchlets, clustered together or scattered over the twigs, attached to them with a slightly thickened base, green in colour, oval in form, with a small circular opening at the apex. The outer surface is sometimes roughened; walls thin, hard; gall chamber large, oval. Height 12 mm., diameter 8 mm.

Female coccid yellowish-brown, broadly rounded at the apex, turbinate, the abdominal segments contracted to the terminal ones which are narrow; anal appendages black, very small, separated from the base and pointed at the tips. Ventral surface of the usual wrinkled form, the cephalic portion folding over the thoracic segments, which are well defined, the first and second depressed in the centre, with the third rounded across the body. Abdominal segments well defined, the last two very small. Length 9 mm., width 6 mm.

Antennae reddish-brown, small, terminal one with tip curving inward. Legs normal, first and second pairs small. Hind ones longest, basal joint broad, rounded, second short, third short, blunt and curved inwards. Derm thick, with the abdominal segments chitinous. Dorsal surface lightly clothed with small spiny hairs. The abdominal segments also clothed with bands of large spines, crossing

the centre of each segment. On the first these spines are smallest and irregular, on the second to sixth the transverse chitinous bands show groups of pores and bands of fine pointed spines, and spiny hairs increasing in number and density to the base of the anal appendages.

*APIOMORPHA LONGMANI*, n. sp. Plate xvi, fig. 2.

This is one of the species received from the Queensland Museum. Exact locality and specific name of Eucalypt unrecorded. Locality, Queensland.

The ♂ galls reddish-brown, produced upon the leaves, typical tubular form with the apex dilated. Height, 4 mm.

The ♀ galls formed upon the branchlets, the action of the coccid causing a circular raised platform about 13 mm. in diameter and 6 mm. above the surface of the surrounding stem; from the centre of this, the circular gall stands up 10 mm., with basal diameter 8 mm., and apical diameter 3 to 4 mm.; truncate at the apex with a small circular anal aperture.

Female coccid yellow, legs and antennae reddish-brown, anal appendages black, tipped with reddish-brown. General form turbinate, abdominal segments elongated. Cephalic and thoracic portion rounded to the second pair of legs. Anal appendages rounded at the base, stout, long, separated from each other two-thirds from the base, rugose on the sides as if annulated, fringed with stout reddish hairs, and several stout spines towards the tips. Legs large, stout, first joint broad, second swollen, oval, truncate at the base and rugose on the inner margins, tarsal claws small, pointed. Antennae small, with short irregular joints. Dorsal surface clothed with rather long, scattered, spiny hairs on the cephalic portion and thoracic segments, thickly fringing the abdominal segments in regular bands and finest at the base of the anal appendages. Abdominal segments, with the first and second segments with transverse bands of irregular spiny hairs, third with similar bands interspersed with stout spines, fourth with similar band as third but further thickened with stout lobed spines, last two segments banded in a similar manner with longer, slender spines on the sides of the apex of the last two segments.

*APIOMORPHA ANNULATA*, n. sp. Plate xvi, fig. 6.

This coccid is also described from specimens in the Queensland Museum, with no record of exact locality or specific name of Eucalypt. Habitat, Queensland.

The ♂ galls scattered over the surface of the leaves, generally in line with, if not upon, the midrib of the leaf, typical cylindrical form dilated at the apex. Height 5 mm., diameter 1.5 mm.

The ♀ galls growing on the branchlets singly or in groups of three or four, contracted and rounded at the base, cylindrical to the truncate apex, which is smooth, depressed in the centre, where it is slightly funnel-shaped, with a rather large circular orifice at the bottom. The basal portion of the gall is green, the apical portion ringed with light-brown scars. Sometimes the whole of the gall is ringed with these roughened scars, only the base being smooth. Height 12 mm., diameter 6 mm.

Female coccid dull-yellow with darker transverse bands along the upper half of the thoracic and abdominal segments. Antennae and legs yellowish-brown, anal appendages reddish-brown. General form turbinate, abdominal segments of uniform width. Length 8 mm., diameter 5 mm.

Antennae small, second and third joints rounded to the tip. Legs: first pair small, second and hind pairs large, basal joint squat, irregularly oval, second joint swollen in the centre, third joint or tarsal claw short, arcuate on the side, tip blunt. Dorsal surface of cephalic and thoracic segments covered with very small scattered tubercles each bearing a short, pointed bristle, the abdominal segments more thickly clothed with similar, tiny tubercles and a short band, increasing in length and density to the sixth segment, of large irregularly-rounded brown tubercles each bearing a short conical spine. Anal appendages reddish-brown, well developed, long, rounded on base and sides, which are serrate and fringed with fine hairs, finely pointed at the tips, which are almost in contact, with only a slight opening between them towards the tips.

*APIOMORPHA FUSIFORMIS*, n. sp. Plate xvi, fig. 3.

The galls of this curious species also came from the Queensland Museum collection. Exact locality and specific name of Eucalypt unrecorded. Habitat, Queensland.

The ♂ galls unknown.

The ♀ galls produced on the surface of the leaves, singly or in groups of three or four, spindle-shaped, slender, cylindrical, narrowest at the base, broadest at the apex which forms a convex button of light-yellow, in the centre of which is the rounded anal aperture. Length 13 mm., diameter at base 1.5 mm., in the centre 2 mm. Probably coloured green when fresh.

Female coccid dull-yellow, legs and antennae brownish, anal appendages light reddish-brown. General form round, tapering to tip of abdomen, elongate. Length 7 mm. Antennae very small, legs small, hind pair hardly larger than the fore and middle pairs, basal joint short and broad, second joint short, broad, tarsal joint small, narrow, coming to a point. Dorsal surface lightly clothed with rather long fine hairs. The fourth, fifth and sixth abdominal segments with a transverse row of widely separated, small, short, conical spines. Anal appendages with a cone-shaped base, slightly rounded at junction with the last abdominal segment, truncate at base with the anal appendages only occupying half the apex which is fringed with fine hairs. Anal appendages narrow, straight, of uniform width to the tips, which are deeply arcuate, with a sharp point on either side, slightly serrate on the outer margins.

*APIOMORPHA SPINIFER*, n. sp.

The specimens were sent to me by Mr. Herbert Jarvis from Stanthorpe, Queensland. He collected them upon the foliage of an undetermined species of Eucalypt growing in that district.

The ♂ galls unknown.

The ♀ galls are scattered over the surface of the foliage in a similar manner to those of *Apiomorpha fusiformis*, which they resemble in general form. They differ in being slightly shorter, cylindrical in form, not contracted at the base, but of a uniform thickness to the apex which is similar in form and coloration, but more depressed round the anal aperture.

The female coccid is very similar in form, but the cephalic fold bears a short transverse chitinous plate near the summit, apparently above the base of the antennae, on which are three or four stout, short spines. The derm is more chitinous, particularly upon the abdominal segments. The thoracic segments and abdominal segments have a row of stout spines along the lower margin

varying in number on each. The first abdominal segment has a row of three, the second five, the third seven, fourth none to thirteen, the fifth five to seven, and the sixth six to eleven. The anal appendages reddish-brown and somewhat similar in structure to those of *Apiomorpha fusiformis*, except that the inner spine is much smaller than the outer point. The curious stout spines on the cephalic portion are quite unique and unknown upon any other species of the genus.

APIOMORPHA DIPSACIFORMIS Froggatt. Plate xvi, fig. 5.

This year I have received a fine series of the male and female galls of this fine species from Mr. J. Macqueen, who collected them upon the branchlets of the narrow-leaved ironbark, *Eucalyptus pilligaensis* at Millmerran, Southern Queensland.

This is an interesting record because the exact locality or host-plant of the type was unknown when I received a bunch of female galls from South Australia with the information that they had been collected in Queensland. It is evident, as can be seen in the figures given, that as the female galls mature the spiny filaments covering the surface become dry and brittle and break off. In the type the spiny filaments were much more developed and perfect than those figured in the present plate.

The male galls (previously unknown) are somewhat like those of the allied species, *Apiomorpha excupula*, being attached to the twigs in the same manner in irregular little masses of tangled tubes, but are shorter, more irregular in form, and the filaments covering them are so fine that they almost look woolly. The closed apex is more rounded and ribbed, but opens out later in the same manner. In fresh specimens they vary in colour from light-red to reddish-brown and if anything are more massed together at the base.

APIOMORPHA DUPLEX Sch. Plate xvii, fig. 4.

The female gall of this remarkable species is probably the largest insect gall in the world. I have had specimens more than a foot in length from the base of the gall to the tips of the stout flattened horns. As they spring directly from the side of a branch and are of the same green tint as the surrounding leaves, with their curling leaf-like tails, in spite of their size, they easily escape detection. This species seems to have a restricted range and, as far as we know, its commonest locality is the Hawkesbury River district, ranging north as far as Glen Innes, but C. French, Jr., has found it at Dandenong Ranges, Victoria. The following is its range, with the host-plants: *Eucalyptus piperita*, Katoomba; *E. haemastoma*, *E. Camfieldi* and *E. eugenioides*, Hornsby (W. F. Blakely); *E. occidentalis*, Glen Innes (I. Dorrington); *E. saligna*, Thornleigh (W. W. Froggatt); *Eucalyptus* sp., Paterson River (Rev. H. M. R. Rupp); *Eucalyptus* sp., Cheltenham (H. E. Ellen).

Though the female galls have been known since Schrader described the species in 1862, we had no knowledge of the male galls until I found the specimens now figured, in the Herbarium of the Botanic Gardens, together with a female gall sent to the Curator by Mr. H. E. Ellen.

Male galls massed together covering both sides of leaves and branchlets between them; there are more than a thousand galls on the leaves figured. They are dark-red, faintly striated on the outer surface, cylindrical, of uniform thick-

ness from attachment to the surface of leaf to the apex, the latter rounded and closed (until the gall is full grown) with a raised cork-like plug. When it falls out the rounded apex is slightly expanded. They average 7 mm. in height. Diameter 1.5 mm.

APIOMORPHA EXCUPULA Fuller. Plate xvi, fig. 1.

This species was originally described from the Port Stephens district. I have since had specimens from the Tweed River. I now record them from the following localities in New South Wales: Narrabri, on *Eucalyptus Woollsiana* (J. H. Maiden); Ourimbah, on *E. paniculata* (F. McPhearson); Wollomba State Forest, Nabrac, on *E. paniculata* (L. C. McIvor).

The male galls are either situated upon the twig at the base of the female gall, or more frequently form an irregular mass of twisted tubes turning at all angles, upon the branchlets. Each gall is about 6 mm. in height, of a greenish tint when fresh. It is an irregularly rounded tube, rough and clothed with fine filaments. In the immature specimen the apex is closed and covered with a tuft of filaments like a plug. When adult the plug drops off, leaving a roughened, rounded summit with a rounded opening into the male gall chamber.

APIOMORPHA FLETCHERI Fuller. Plate xvii, fig. 7.

In my previous paper last year, when noting the enormous number of female galls infesting the branches of the Red Box (*Eucalyptus bicolor*) on the Murray River, I stated that the male galls of this species were unknown. Since then I have received a fine series of the male galls with some female galls infesting the leaves of the Long-leaved Box (*Eucalyptus elaeophora*) collected by Mr. C. French, Jr., at Dandenong, Victoria. I have also a record of specimens of the female galls being collected at Gulgong, New South Wales (J. H. Maiden and J. L. Boorman) on *Eucalyptus tereticornis*. The ♂ galls are rich deep pink with a whitish bloom covering the upper surface. They are very slender, cylindrical tubes, broadest at the base, tapering slightly to the open apex, which is not dilated like the typical tubular galls of other species. They measure from 3 to 4 mm. in height and hardly 1 mm. in diameter. They are massed together on the upper surface of the leaves, so as to be almost in contact at the base. There are more than 1,100 tubular galls on the largest leaf figured.

APIOMORPHA PHARATRATA Sch. Plate xvii, figs. 5, 6.

Two figures are given to show the normal form and the abnormal form when the male gall-mass is many times larger than the overshadowed female gall.

There are three species described of these curious combined male and female galls, formed by these coccids. The elongate-oval female gall is produced upon the midrib or base of a leaf stalk, and in some remarkable way the male larvae gather together on the side of the well-grown female gall, and by their united action cause a rounded excrescence to grow out from the surface of the female gall. This finally forms a fleshy sheath, rounded above, with the under surface flattened into a mass of coalesced, rounded tubes open at the apex, each containing a winged male. It would be very interesting to watch the early development of these galls for, while both the male and female larvae desert the matured gall at the same time, the female gall has to grow to a certain size before the male larvae can find lodgment upon it.

This species has a wide range: South Australia: Encounter Bay, on *Eucalyptus Baxteri* (Prof. J. B. Cleland); Border Town, on *Eucalyptus* sp. (L. G. Manning); New South Wales: Guyra, on *E. coriacea* (Rev. E. N. McKie); Braidwood, on *E. rubida* (H. A. Vining); Kendall, on *E. ptilularis* (Prof. J. B. Cleland).

APIOMORPHA ROSAEFORMIS Froggatt. Plate xvii, fig. 1.

The type specimen, which came from the Manning River, New South Wales, was much larger than the specimen figured here. It has, however, the same bright coloration and slightly convex under surface of the mass of male galls.

The specimen figured is of a brilliant red tint, but the under surface (the sheath of male galls) is clothed with a white bloom from the floury secretion from the enclosed larval male coccids, so that the outer margin is much brighter than the rest of the gall mass.

*Habitat*.—Middle Harbour, Sydney, N.S.W., on *Eucalyptus* sp. (Prof. J. B. Cleland).

APIOMORPHA THORNTONI Froggatt. Plate xvii, figs. 2, 3.

This is a very variable form of the "cocks-comb" group; the female galls formed on the leaves upon the main rib or stalk, oval and ribbed; the mass of male galls often very wrinkled and irregular in form.

Lately I have received a very fine series of immature female galls from Archdeacon Haviland, who collected them at Portland on an undetermined species of *Eucalypt*. The first form of the female gall is an irregular, rounded rosette of soft reddish tissue with a roughly granulated surface, which, when opened, shows a tiny, white, oval cell, based on the surface of the leaf. The coccid enclosed is pale-yellow, rounded and thickly covered with floury matter and bearing two white tails. At this stage the galls are about 3 mm. in diameter. When more developed, though still rosette-like, they stand up from the leaf and the apex is open and surrounded with floury matter. These contain perfectly-formed pupal coccids (if we can use the term), somewhat more elongate in form than the adult female. They have the same development of legs and anal appendages, and the rows of spines across the dorsal surface of the abdominal segments are very well defined. The female galls are usually almost full-sized before the mass of male galls accumulates and develops.

APIOMORPHA URNALIS Tepper. Plate xvi, fig. 4.

This species has a wide range over Australia from the west, across South Australia and Victoria, through New South Wales to Southern Queensland. It is an inland form and very partial to the small Mallee Scrub gums. It is very variable in form, but the thick-set vase shape is the most typical form, as figured (Plate xvi, fig. 4).

I have included it in my plate to show the variation in the form of the female gall. The following localities and host-trees are recorded: Millmerran, South Queensland, on *Eucalyptus pilligaensis* (J. Macqueen). New South Wales: Condobolin, on *E. sideroxylon* (J. H. Maiden); East Merool, on *E. macrocarpa* (W. Campbell); Kenmore, on *E. melliodora* (J. H. Maiden). South Australia: Paretta Forest, on Mallee (*E. calycogona*) (Botanic Gardens Herbarium); Border Town, on *E. gracilis* (L. E. Manning). Western Australia: Conderdes, on *E. spathulata* (W. V. Fitzgerald); Swan River, on *Eucalyptus* sp. (L. J. Newman).

## EXPLANATION OF PLATES XVI-XVII.

## Plate xvi.

1. *Apiomorpha excupula*, showing the peculiar form of the ♂ galls and the various forms of the ♀ galls in all stages of development.
2. *Apiomorpha longmani*, n. sp. ♀ galls on branchlet.
3. *Apiomorpha fusiformis*, n. sp. ♀ galls on leaves.
4. *Apiomorpha urnalis*, showing the variations in form of the ♀ galls.
5. *Apiomorpha dipsaciformis*, showing ♂ galls in groups like those of *A. excupula* and variations in form of ♀ galls.
6. *Apiomorpha annulata*, n. sp., showing ♂ galls on leaves and ♀ galls on branchlet.

## Plate xvii.

1. *Apiomorpha rosaeformis*, showing the rounded mass of ♂ galls above the slender ♀ gall attached to the leaf.
  2. *Apiomorpha thurtoni*, showing immature ribbed ♀ galls on leaf before the ♂ gall develops.
  3. *Apiomorpha thurtoni*, with the ♂ galls above the single ♀ galls, when adult.
  4. *Apiomorpha duplex*, showing twig and leaves encrusted on both sides with ♂ galls.
  5. *Apiomorpha pharatrata*. Typical ♀ gall with mass of ♂ galls.
  6. *Apiomorpha pharatrata*, with an abnormal mass of ♂ galls on ♀ gall.
  7. *Apiomorpha fletcheri*, showing massed ♂ galls on upper surface of leaves.
-